

[0066] As mentioned above, the at least one slave device (S) connected to the communication unit **100** may have a bandwidth occupancy rate corresponding to the packet type of the slave device (S).

[0067] FIG. 2 illustrates three time slots D_1 , D_2 , and D_3 that are occupied by three slave devices S_1 , S_2 , and S_3 , respectively. Particularly, FIG. 2 illustrates an example in which the slave device S_1 occupies D_1 that is 25% of an entire bandwidth BW, the slave device S_2 occupies D_2 that is 25% of the entire bandwidth BW, and the slave device S_3 occupies D_3 that is 20% of the entire bandwidth BW.

[0068] In addition, the communication unit **100** may assign a certain time slot in the bandwidth for the above mentioned pre-communication (P_r). That is, the communication unit **100** may perform the pre-communication (P_r) for a slave device (S) in a connectable state, and when the master device (M) and the slave device (S) are connected, communicate with the slave device (S) in the connection state in a single frame.

[0069] Referring to FIG. 2, the communication unit **100** may assign a time slot (I) that is 5% of the entire bandwidth, to send the inquiry message to the slave device (S), and assign a time slot (P) that is 5% of the entire bandwidth, to transmit the page message from the slave device (S). In the time slot (I) that is 5% of the entire bandwidth, the communication unit **100**, as a master device (M), transmits the inquiry message to the slave device (S), and as a slave device (S) in a relationship with another master device (M), scans an inquiry message from the another master device (M). In addition, in the time slot (P) that is 5% of the entire bandwidth, the communication unit **100**, as a master device (M), transmits the page message to the slave device (S), and as a slave device (S) in a relationship with another master device (M), scans a page message from the another master device (M).

[0070] In addition, the communication unit **100** may assign a time slot BLE_1 that is 10% of the entire bandwidth to perform Bluetooth Low Energy (BLE) scan in a pre-communication (P_r) of a BLE communication, and assign a time slot BLE_2 that is 5% of the entire bandwidth to perform BLE advertisement.

[0071] As a result, 95% time slot of the entire bandwidth may be occupied as illustrated in FIG. 2, and the communication unit **100** may normally communicate with three slave devices (S).

[0072] However, in a case where a data transmission bandwidth exceeds the available bandwidth (e.g., remaining time slot of the bandwidth of the communication unit **100**), the communication unit **100** may not normally perform the communication. In other words, when a data transmission causes the bandwidth occupancy rate to be greater than 100%, the communication unit **100** may generate an error. Accordingly, there may be “buffering” in the slave device (S) connected to the communication unit **100**.

[0073] FIGS. 3A and 3B are views illustrating examples in which an error may be generated during data transmission of the communication unit of FIG. 2.

[0074] The communication unit **100** of FIG. 2 may be additionally connected to a slave device S_4 as well as the slave devices S_1 to S_3 . As illustrated in FIG. 3A, when a time slot D_4 , which is 20% of the entire bandwidth, is occupied according to a packet type employed by the slave device S_4 , the entire bandwidth occupancy rate may become 115%.

Therefore, in this case, since the data transmission of which bandwidth exceeds the available bandwidth is performed, an error may occur.

[0075] On the other hand, when a communication environment between the communication unit **100** of FIG. 2 and the slave device S_3 is unstable due to the interference of the signal, an additional time slot may be occupied to perform data retransmission. As illustrated in FIG. 3B, when a time slot D_{3+} that is 10% of the entire bandwidth is assigned to the slave device S_3 to perform the data retransmission, in addition to the time slot D_3 that is 20% of the entire bandwidth and occupied by the slave device S_3 , the entire bandwidth occupancy rate may become 105%. Therefore, in this case, since the data transmission of which bandwidth exceeds the available bandwidth is performed, an error may occur.

[0076] Therefore, when the data transmission bandwidth exceeding the available bandwidth of the communication unit **100** is performed, the efficient management of the bandwidth may be needed so that the communication is normally performed.

[0077] To this end, when the data transmission of which bandwidth exceeds the available bandwidth is performed, the controller **200** may control the communication unit **100** so that the communication unit **100** stops the above mentioned pre-communication (P_r).

[0078] FIG. 4 is a view illustrating an example in which a controller controls the communication unit in response to an error generated in FIG. 3A.

[0079] As illustrated in FIG. 3A, when the data transmission of which bandwidth exceeds the available bandwidth is performed to connect the communication unit **100** to a plurality of slave devices, an error may occur. Therefore, the controller **200** may determine whether the data transmission of which bandwidth exceeds the available bandwidth is to be performed. To this end, the controller **200** may estimate a bandwidth occupancy rate based on a packet type selected by the slave device (S) in a connection state, and a data transmission period. Alternatively, the controller **200** may determine whether the data transmission of which bandwidth exceeds the available bandwidth is to be performed by determining whether the number of the slave device (S) is equal to or more than a threshold value. For example, the threshold value may be stored in the storage **500** in advance.

[0080] When it is determined that the data transmission of which bandwidth exceeds the available bandwidth is to be performed, the controller **200** may control the communication unit **100** so that the communication unit **100** stops performing the pre-communication (P_r) with an adjacent slave device (S) that is connectable.

[0081] For example, the controller **200** may stop performing the pre-communication (P_r) so that the time slot that is assigned to perform the pre-communication (P_r) may be cancelled. As a result, 25% of the entire bandwidth may be additionally secured. As illustrated in FIG. 4, the communication unit **100** may assign a time slot D_4 that is 20% of the entire bandwidth, to perform the communication with the slave device S_4 . Accordingly, 90% of the entire bandwidth may be occupied by the slave devices S_1 to S_4 , and the communication unit **100** may be allowed to communicate with the slave devices S_1 to S_4 without buffering.

[0082] Although it is described above that the controller **200** controls to stop performing the pre-communication (P_r) when it is determined that the data transmission to be